Patent Claims

1. A contactless system for measuring centricity and diameter, said system comprising:

i) An optical measuring device (13, 13', 14, 14') for determining the external diameter and the position of a cable (3) in an optical measuring plane that is arranged perpendicular and transverse to the central axis Z of a measuring device (2), wherein the cable (3) comprises a conductor (4) with insulating jacket (5) and is pulled in the direction of the central axis Z through the measuring device (2);

ii) An inductive measuring coil arrangement (1) for determining the position of the conductor (3) [sic] in an inductive measuring plane, which is also arranged perpendicular to and transverse to the central axis Z of the measuring device (2) and

iii) Means which correlate the position of cable (3), determined with the optical measuring device (1), and the position of conductor (4), determined with the inductive measuring coil arrangement (1) and that from the obtained values, the centricity of the conductor (4) inside the jacket (5) is computed,

characterized in that

the measuring coils ($-X^1$, $-X^2$, $+X^1$, $+X^2$, $-Y^1$, $-Y^2$, $+Y^1$, $+Y^2$ or $+X^{12}$, $-X^{12}$, $+Y^{12}$, $-Y^{12}$ or X^1, X^2, Y^1, Y^2) of the measuring arrangement (1) are arranged in pairs or cut in half with respect to the optical measuring plane and determine on the one hand the field intensity in front of the optical measuring plane and, on the other hand, the field intensity behind the

optical measuring plane and that the field intensities determined in the process are correlated such that the field intensity in an active inductive measuring plane is obtained, which coincides with the optical measuring plane by forming a joint, active measuring plane M.

2. The device according to claim 1, characterized in that respectively one optical measurement takes place in a direction X, which is perpendicular to the central axis Z, and a direction Y that is also perpendicular to the central axis Z and that the X- and Y-directions enclose an angle, in particular a 90° angle.

3. The device according to claim 2, characterized in that the optical measuring device (13, 13', 14, 14') is provided with two light sources (13, 13') of which one (13) emits light (18) in the X-direction and the other one (13') emits light (18') in the Y-direction onto the cable (3) and that the device is provided on the opposite side of cable (3) with respectively one light sensor (14, 14') which detects the light (18, 18') emitted by the opposite-arranged light source (13, 13').

4. The device according to claim 1, 2 or 3 characterized in that all measuring coils ($-X^1$, $-X^2$, $+X^1$, $+X^2$, $-Y^1$, $-Y^2$, $+Y^1$, $+Y_2$ or $+X^{12}$, $-X^{12}$, $+Y^{12}$, $-Y^{12}$ or X^1, X^2, Y^1, Y^2) of the measuring coil arrangement (1) have the same form and effective surface.

5. The device according to one of the preceding claims, characterized in that a device (6, 7, 8) for inducing a high-frequency alternating current in the conductor (4) is provided and that the effective surfaces of the measuring coils extends in a X-plane or a Y-plane, that the X-plane and the Y-plane intersect and enclose an angle, especially a 90° angle, and are positioned perpendicular on the measuring plane M and that the central axis Z extends along the intersecting line for the X-plane and the Y-plane.

6. The device according to claim 5, characterized in that the measuring coil arrangement (1) comprises four measuring coil pairs (+X, -X, +Y, -Y), that four separate measuring coils ($+X^1$, $+X^2$, $-X^1$, $-X^2$) are positioned in the X-plane and that four separate measuring coils ($+Y^1$, $+Y^2$, $-Y^1$, $-Y^2$) are arranged in the Y-plane, that a separate measuring coil ($+X^1$, $-X^1$ or $+Y^1$, $-Y^1$) of a measuring coil pair (+X, -X, +Y, -Y) is positioned in front of the measuring plane M and that the other separate measuring coil ($+X^2$, $-X^2$ or $+Y^2$, $-Y^2$) of this measuring coil pair (+X, -X, +Y, -Y) is arranged behind the measuring plane M and that the separate measuring coils ($+X^1$, $+X^2$, $-X^1$, $-X^2$, $+Y^1$, $+Y^2$, $-Y^1$, $-Y^2$) are arranged symmetrical to the measuring plane M and to the central axis Z.

7. The device according to claim 5, characterized in that the measuring coil arrangement comprises four measuring coils in the form of differential coils (X^1, X^2, Y^1, Y^2) and that the differential coils (X^1, X^2) or (Y^1, Y^2) respectively form one measuring coil pair, for which the effective surface is cut in half with respect to the central axis Z.

8. The device according to claim 7, characterized in that the these differential coils (X^1, X^2, Y^1, Y^2) are provided with winding sections (21, 21'), extending on both sides of the central axis Z and parallel thereto, which are connected via connecting bends (22, 22') that extend concentric to the central axis Z and that the parallel winding sections (21, 21') extend either in the Y-plane or the X-plane.

9. The device according to claim 5, characterized in that the measuring coil arrangement has four measuring coils ($+X^{12}$, $-X^{12}$, $+Y^{12}$, $-Y^{12}$) which are cut in half by the measuring plane M, such that two ($+X^{12}$, $-X^{12}$) are located in the X-plane and two ($+Y^{12}$, $-Y^{12}$) are located in the Y-plane.

10. The device according to one of the claims 5 to 9, characterized in that the X-direction for the optical measurement is located in the X-plane for the inductive measurement and that the Y-direction for the optical measurement is located in the Y-plane for the inductive measurement.

11. A method for the contactless determination of the external diameter of a cable, comprising a conductor with insulating jacket on the one hand and the centricity of the conductor inside the jacket on the other hand, wherein the cable is pulled through a measuring device in which

i) The position and external diameter of the cable is optically determined in an optical measuring plane, which is arranged perpendicular and transverse to the central axis Z of the measuring device;

ii) The position is determined inductively in an inductive measuring plane, which is also arranged perpendicular and transverse to the central axis Z of the measuring device, and

iii) The optically measured position of the cable and the inductively determined position of the conductor are correlated and that from this correlation the centricity of the conductor inside the jacket is computed,

characterized in that

the field intensities in front of the optical measuring plane as well as the field intensities behind the optical measuring plane are determined and that the field intensities determined in this way are correlated, such that the field intensity in an active inductive measuring plane results, which coincides with the optical measuring plane by forming a joint active measuring plane M.

12. The method according to claim 11, characterized in that the optical measurement and the inductive measurement take place simultaneously and that the measured data are processed in real time.

See page(s) 8 drawings for this
